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SILVICAL CHARACTERISTICS of WESTERN JUNIPER

by JAMES E. SOWDER and EDWIN L. MOWAT

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Western juniper (Juniperus occidentalis),[1/] a small to medium-sized tree, is commonly found in open stands on mountain slopes and high plateaus in western Idaho, eastern Washington, eastern Oregon, and northern California, and along the eastern and upper slopes of the Sierra Nevada as far south as the San Bernardino Mountains of southern California (10, 13, 9)[2/] (fig. 1). It is also found as scattered individual trees and in small groups outside this major range.

Although now commonly known as western juniper, it has also been referred to as Sierra juniper, yellow cedar, western cedar, and western redcedar (4). It is 1 of about 8 species of tree-sized junipers that inhabit the drier parts of the Rocky Mountain and Pacific Coast regions. All of them are similar in general appearance and silvical habits, and most people do not distinguish between the separate species. However, other species do not occur in abundance within the main range of western juniper in Oregon and California, so there is usually little question of its identity.

[1/] Scientific and common names of trees in this publication follow: Check list of native and naturalized trees of the United States (including Alaska). U. S. Dept. Agr. Handb. 41, 472 pp. 1953.

[2/] Underscored numbers in parentheses refer to Literature Cited.

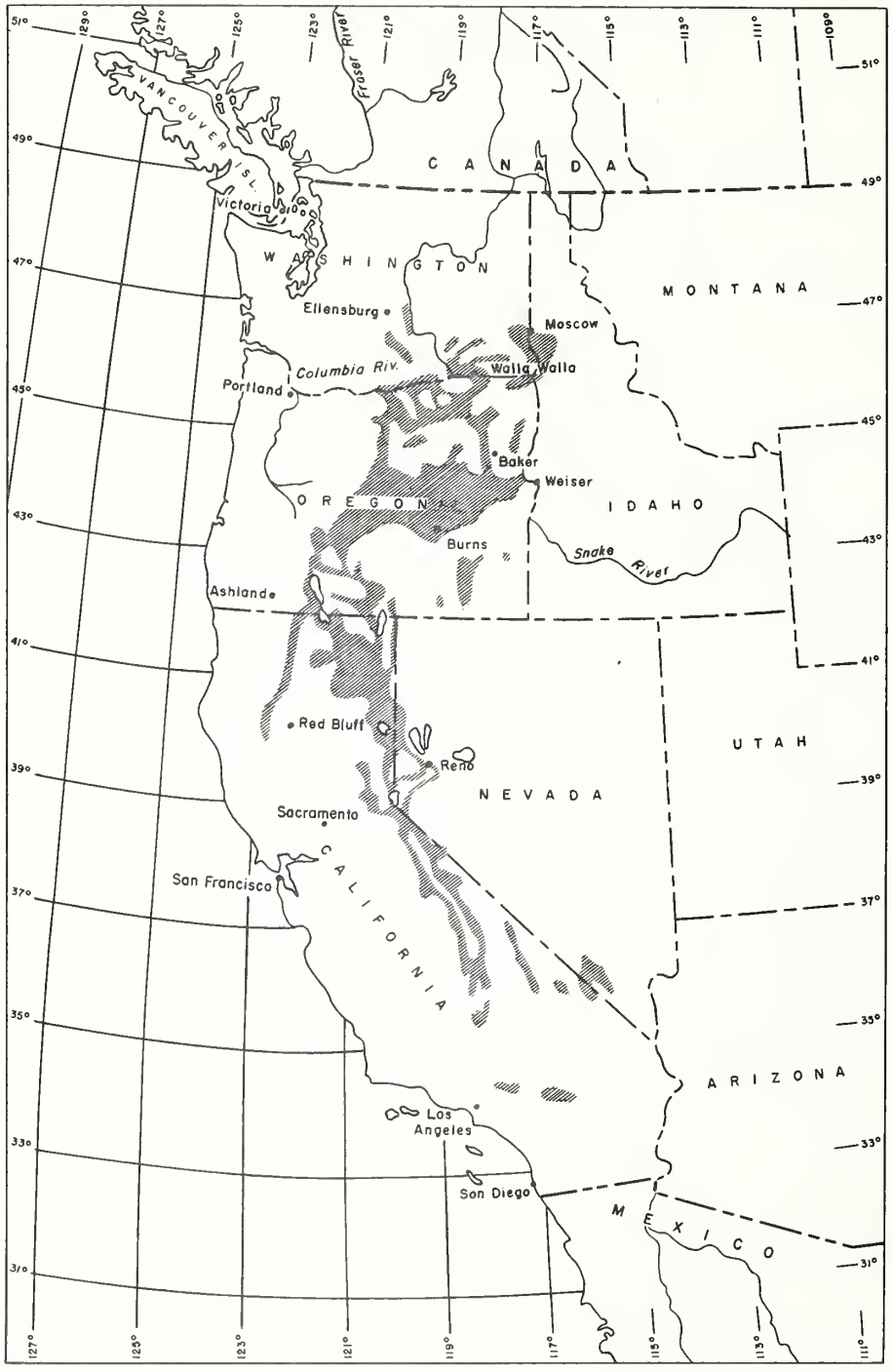

Figure 1.--Range of western juniper.

HABITAT CONDITIONS

Climatic

The climate of most of the western juniper area north of the Sierra Nevada is characterized by long, dry summers; cold winters; and very limited moisture. Annual precipitation is usually 10 to 13 inches, with two-thirds coming as snow during the winter months. Temperatures range from 105° to -36° F., and there are seldom more than 130 frost-free days during a year. Average July temperature is about 66° F. (8). In the high Sierra, annual precipitation is much higher--50 to 55 inches--but otherwise the climate is as severe as elsewhere in the western juniper range.

Edaphic

The largest continuous areas of western juniper are found in northeastern California and central Oregon on shallow, rocky soils overlying basaltic lava resulting from geologically recent volcanic activity (fig. 2). In eastern Oregon and eastern Washington and in

Figure 2.--Western juniper woodland type in central Oregon. Most of the trees in this view are immature; the tree in the left foreground is about 60 years old.

western Idaho, the species is usually found on shallow soils of sedimentary origin. In the Sierra Nevada of California, it commonly occupies shallow soils of granitic origin and granite crevices on windswept ridges (9). In general, western juniper occupies sites where few if any other trees will survive (12, 11), but occasionally specimens are found growing on good sites (11). One such tree on the Stanislaus National Forest in California, reported in 1955, was 81 feet tall and 13.4 feet in diameter at a point 4-1/2 feet from the ground (1).

Physiographic

Western juniper grows at various elevations throughout its wide range. Along the Columbia River drainage of eastern Washington, it is found in scattered locations at 600 to 1,800 feet elevation. It occurs most abundantly on high plateaus at 3,000 to 4,000 feet through central Oregon and at 4,000 to 5,000 feet in northeastern California. In both these areas, the species is also common on intermingled and adjacent rolling hills at somewhat lower and higher elevations. Southward in the high Sierra, it is found at 6,000 to 10,600 feet (9, 11).

Biotic

Jepson (8) reports that western juniper is an important species of the Hudsonian life zone in the high Sierra, along with whitebark pine (Pinus albicaulis). North of the Sierra, the common range of western juniper is the upper limits of the Upper Sonoran Life Zone and adjacent to the Transition Life Zone (2). It is commonly found between desert or grassland areas and ponderosa pine (Pinus ponderosa) areas. Its associated woody vegetation is that of the desert-grassland types, including sagebrush (Artemisia spp.), rabbitbrush (Chrysothamnus spp.) and antelope bitterbrush (Purshia tridentata) (7). It also occurs in mixture with ponderosa pine in bordering areas and in small patches, usually on poor sites, well within the pine type.

LIFE HISTORY

Seeding Habits

Male and female flowers are borne on different trees. The fruit, a modified cone called a berry, usually produces 2 seeds, rarely 1 or 3. Western juniper produces fruit abundantly nearly every year (11, 12), but it takes two years for the fruit to mature. Records covering a 7-year period in central Oregon show pollen shedding from May 5 to May 19 and seed ripening about September 22.[3/] Both birds and mammals, especially birds, eat the berries and thus play an important part in the dissemination of seed (12).

Vegetative Reproduction

Most junipers can be grown from cuttings and some by layering (13). J. D. Curtis, Intermountain Forest and Range Experiment Station, U. S. Forest Service, has reproduced western juniper by cuttings; L. A. Isaac, Pacific Northwest Forest and Range Experiment Station of the Forest Service, has successfully grafted planting stock.

Seedling Development

Establishment.--Seedlings occur only on pure mineral soil (11, 12). They usually occur as scattered individuals except along fence rows, where they may be closely spaced as in a hedge. Seedlings are also found under ponderosa pine and other trees growing near a juniper area, apparently "planted" by birds. Most germination occurs in the spring, but seed may remain dormant a year or more (13).

Early growth.--During its youth, western juniper is usually a well-formed tree with full crown and straight bole. Although no data are available, observations indicate that early growth rate is fairly good, considering the poor sites that juniper usually occupies.

3/ Average day of year on which given phenological development occurred in given species at points in Oregon and Washington. Dec. 9, 1952. (Unpublished report. On file U. S. Forest Serv., Pac. NW. Forest and Range Expt. Sta.)

Sapling Stage to Maturity

Growth and yield.--Mature trees are usually 15 to 30 feet in height, rarely 60 feet or more. It is considered a long-lived tree. Although age is imperfectly known, estimates place some of the oldest at 800 to 1,000 years or more (12, 4, 11). Western juniper is usually full crowned, and rarely has as much as 4 to 8 feet of clear bole (cover photo). It often develops heavy limbs and a ragged, gnarled appearance (11, 4).

Reaction to competition.--Western juniper always grows in full light and appears to be intolerant of shade (11, 12). Baker (3) lists it as intolerant but with a notation "classification very uncertain."

Western juniper apparently does not compete well with trees that occupy better sites. This largely limits its range to areas where other trees will not grow. It will, however, "invade" adjacent grassland areas when vegetation competition is reduced by overgrazing, especially where wildfire has been excluded. This indicates that western juniper will grow over a wide range of soil and climatic conditions but may be limited in range largely by competition from other vegetation.

Damaging agents.--Birds and many mammals feed on the berries of western juniper (12). Mule deer (Odocoileus hemionus) feed on the foliage of selected trees, but the reason they select certain trees to feed upon year after year and avoid other trees is not known.

Juniper fomes (Fomes juniperinus), a heartwood white pocket rot of the living tree, causes losses so high in western juniper that it has usually been unprofitable to exploit this species for pencil wood. A tree with a single conk is usually unmerchantable (5).

A mistletoe, probably Phoradendron ligatum, is parasitic on western juniper, causing deformity of branches, abnormal "blooming" of foliage, and lowered vigor of the tree (5). Similar mild damage, particularly the formation of conspicuous witches' brooms, is caused by a stem rust (Gymnosporangium kernianum). At least two other species of Gymnosporangium rust that infect the foliage of western juniper have been reported (5). Extent of damage is not known.

The juniper bark beetle (Phloeosinus juniperi) attacks the trunks of western juniper and often kills trees (6), especially during drought years.

Young trees are easily killed by ground fires. Older trees, because of their thicker bark and higher crowns, are moderately resistant. Persistence of juniper on some sites may also be credited to its habit of growth in open stands and where ground vegetation is too sparse to carry a hot fire.

SPECIAL FEATURES

Seasoned heartwood of western juniper is remarkably durable (12), making it desirable for fence posts. When finished and polished, the wood has exceptional beauty and so is used for manufacture of novelties. However, suitable material for this purpose is scarce, and seasoning is a problem.

Most western juniper is unsuitable for lumber manufacture because of small size, rapid taper, poor form and roughness of older trees, high incidence of rot, and seasoning difficulties.

Western juniper often gives greenness and variety to the landscape, provides shade, and helps to hold and build the soil in places that would otherwise be barren. It is even used for Christmas greens where other trees are scarce. In the past, the fruit was gathered and eaten by California Indians (10).

RACIAL VARIATIONS

The writer has found no record of recognized racial variations of western juniper. However, occasional occurrence of "sports," which vary markedly in appearance from their neighbors, has been recognized. One outstanding example is a tall, narrow-crowned, spire-type tree (resembling Italian cypress in appearance) found near Prineville, Oreg.

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